REMARKS

Favorable reconsideration is respectfully requested.

The claims are 1 to 3, 5, 7 to 20 and 28 to 40.

The above amendment is responsive to points set forth in the Official Action.

In the above amendment to claims 1, 13, 28, 36 and 38, there has been added the phrase "wherein the contaminated matter mixed with the reducing agent and the nutritional liquid has a water content of at least 40% by weight". This amendment is supported by the description in the specification from page 15, line 26 to page 16, line 1 and page 28, lines 11 to 15. Further, the description in the specification from page 13, line 28 to page 14, line 3 discloses the addition of 15 to 25% by volume of the nutritional liquid to the contaminated matter which is simultaneously or subsequently contacted with a reducing agent. Since the content of typical soil is around 30%, the water content of the contaminated matter such as soil should be over 40% by weight after addition of the liquid (an aqueous solution).

Further, Examples 1 and 2 used contaminated matter containing 48 to 53% by weight of water when a reducing agent is contacted with the contaminated matter.

The water content of the contaminated matter of the amended claims is thus supported by the description of the specification.

The significance of this amendment will become further apparent from the remarks below.

Claims 1 to 3, 5, 7 to 20 and 28 to 40 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

This rejection is respectfully traversed.

With regard to support for the term "oxidation reduction potential of the contaminated matter reduced is maintained at not more than -350 mV for at least 5 days by adding the reducing agent" in claims 1, 13 and 28, the oxidation reduction potential (ORP) of the contaminated matter is decreased after addition of the reducing agent to less than -350 mV within a short time (e.g.

less than one hour in Examples 6, 7 and 8) and is maintained at the ORP value for at least 5 days. The value of ORP is supported by the following description in the specification:

In Example 4, Table 7, test runs 4-2 and 4-3 showed 100% decomposition of tetrachloroethylene (PCE)in soil at less than -350 mV of ORP after 60 days of incubation. In contrast, test runs 4-4 and 4-5 showed 70% and 87%, respectively, of residual PCE in soil at higher than -350 mV or ORP after 60 days of incubation.

In Example 5, Table 9, test runs 5-2 and 5-4 showed 65% and 58% of conversion rates of PCE in soil, respectively, at less than -350 mV or ORP after 63 days of incubation. In contrast, test run 5-6 showed only 28% of conversion rates of PCE in soil at higher than -350 mV of ORP after 63 days of incubation.

In Example 10, Table 12 showed that a conversion rate of pentachlorophenol (PCP) in test system 10-1 was 94.3% in soil at -380 mV of ORP after 20 days of incubation. In contrast, Table 13 showed that a conversion rate of PCP in test system 10-2 which contained a medium of Table 11 was 76.5% in soil at -170 mV of ORP after 20 days of incubation.

In Example 11, Table 16, test runs 10-3 and 10-4 showed 81% and 84% of conversion rates of PCE in soil at less than -376 mV and -542 mV of ORP after 30 days of incubation. In contrast, test run 10-2 which contained no nutritional source showed only 26% of conversion rates of PCE in soil at higher than +2 mV or ORP after 30 days of incubation.

From the description of the specification, the limitation of ORP defined in the claims is fully supported.

The above comments are also responsive to the contention that claims 36 and 38 lack description for the term the "oxidation reduction potential of the contaminated matter reduced is maintained at not more than +130 mV for at least 5 days by adding the reducing agent", taken with the disclosure at page 75, lines 14 and 15.

Claims 1 to 3, 5, 7 to 20 and 28 to 40 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Schuring et al (US 5,908,267).

This rejection is also respectfully traversed.

In Schuring et al, the use of compressed gas is essential as a carrier gas on which dry media such as dry powder , particles or beads of silica, carbon, metals or synthetic resin are carried. However, the present invention does not use such a carrier gas for the dry media. In addition, in the amended claims, the contaminated matter is contacted with a reducing agent in a wet-condition; the contaminated matter, which has been mixed with the reducing agent and a nutritional liquid, contains at least 40% by weight of water. This is neither disclosed nor taught by Schuring et al which discloses a method for dispersing and distributing into soil the dry media carried in a gas stream. As stated above, typical soil has a water content of around 30% by weight and therefore, in Schuring et al, typical soil containing contaminated matter does not have a water content of at least 40% by weight when the soil is contacted and mixed with the dry media.

In amended Claim 1, applicants clarify that a water-soluble nutritional source is added in liquid to the contaminated matter. This clearly and unobviously differs from Schuring et al wherein all of the additives are injected into soil as a dry medium carried on a compressed gas stream. The present invention does not use any compressed gas as a carrier.

The feature of oxidation reduction potential (ORP) which has been added to the claim by the previous amendment is rejected by the Examiner on the ground of lack of support in the specification. However, such a feature is well-supported by the present specification for the reasons explained above.

Further, the feature of ORP is essential for obtaining the desired results shown in Examples of the present application. This is one of the essential features of the present invention and therefore, if this feature is not achieved, the desired results can not be obtained.

The relation between ORP of treated contaminated matter and the de-halogenation level of halogenated organic compounds in the contaminated matter was found and confirmed by the present invention.

In order to de-halogenate organic halogenated compounds, which are present in the contaminated matter, to a level that is sufficiently low to be safe in the environment, the ORP of the treated contaminated matter after addition of a reducing agent should be decreased to a low

level such as less than -350 mV in a short time, and maintained at that level for period of time sufficient to cause appropriate dehalogenation.

The ORP of the contaminated matter such as soil will be decreased by chemical reaction in a short time after addition of a reducing agent. Please refer to Examples 6 to 8, and "Engineered Approaches for In Situ Bioremediation of Chlorinated Contamination" Battelle 1999 (Reference 1), and ISEB 2000 (Reference 2). A copy of each of these two references is enclosed. However, the decreased level of ORP will be gradually elevated because materials having oxidizing ability such as oxygen, nitric acid, sulfuric acid, iron oxide and manganese oxide would be supplied to the contaminated matter from the environment.

As shown in Examples 4, 7 and 10 to 13 of the present application, the retention of ORP at a considerably low level for a long time enables decomposition of an organic halogenated compound. Tables 12 and 13 of Example 10 of the present application indicated that if ORP at 20 days after addition of a reducing agent is -380 mV, the residual PCP was only 0.58 mg/kg, which corresponds to 5.7% residual ratio of PCP. In contrast, if ORP is -170 mV at 20 days after addition of a reducing agent, 2.4 mg/kg of PCP is retained; this corresponds to a 23.8% residual ratio.

In addition, Examples 4, 11, 12 and 13 indicated that ORP of the contaminated matter was maintained at a level of less than -350 mV for a time longer than 5 days and that chlorinated compounds were completely decomposed.

For the reasons above, the claims including the specified ORP are unobvious from Schuring et al and accordingly, the rejection on Schuring et al is untenable and should be withdrawn.

No further issues remaining, allowance of this application is respectfully requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact the undersigned at the telephone number below.

Respectfully submitted,

Naoaki KATAOKA et al.

By: _____

Matthew Jacob
Registration No. 25,154
Attorney for Applicants

MJ/jef
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
October 28, 2002

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. **(Twice Amended)** A method for purifying soil, sediment or sludge contaminated with a halogenated organic compound, which method comprises the step of:

adding a reducing agent and a water-soluble organic nutritional liquid containing a nutritional source for a heterotrophic anaerobic microorganism to the contaminated matter, the reducing agent having a standard electrode potential ranging from 130 mV to –2400 mV at 25°C with respect to the standard hydrogen electrode, the reducing agent being at least one species selected from the group consisting of reduced iron, an iron-silicon alloy, a titanium alloy, a zinc alloy, a manganese alloy, an aluminum alloy, a magnesium alloy and a calcium alloy, whereby an oxidation reduction potential of the contaminated matter reduced is maintained at not more than -350 mV for at least 5 days by adding the reducing agent, wherein the contaminated matter mixed with the reducing agent and the nutritional liquid has a water content of at least 40% by weight.

13. **(Twice Amended)** A method for purifying soil, sediment or sludge contaminated with a halogenated organic compound, which method comprises the step of:

adding a reducing agent to the contaminated matter, the reducing agent having a standard electrode potential ranging from 130 mV to –2400 mV at 25°C with respect to the standard hydrogen electrode, the reducing agent being at least one species selected from the group consisting of reduced iron, an iron-silicon alloy, a titanium alloy, a zinc alloy, a manganese alloy, an aluminum alloy, a magnesium alloy and a calcium alloy, whereby an oxidation reduction potential of the contaminated matter reduced is maintained at not more than -350 mV for at least 5 days by adding the reducing agent, wherein the contaminated matter mixed with the reducing agent and the nutritional liquid has a water content of at least 40% by weight.

28. **(Twice Amended)** A method of purifying a contaminated soil, sediment or sludge containing a halogenated compound and a solid matter, which method comprises the step of:

mixing a reducing agent and a water-soluble organic nutritional liquid containing a nutritional source for a heterotrophic anaerobic microorganism and water with the contaminated matter, the reducing agent having a standard electrode potential ranging from 130 mV to –2400

mV at 25°C with respect to the standard hydrogen electrode, wherein the mixing step includes a step of adjusting the contaminated matter at pH ranging from 4.5 to 9.0, whereby an oxidation reduction potential of the contaminated matter reduced is maintained at not more than -350 mV for at least 5 days by adding the reducing agent; and

keeping the mixture in a condition such that air hardly penetrates through a matrix [of said mixture], wherein the contaminated matter mixed with the reducing agent and the nutritional liquid has a water content of at least 40% by weight.

36. **(Amended)** A method for purifying soil, sediment or sludge contaminated with a halogenated organic compound, which method comprises the step of:

adding a reducing agent and a water-soluble organic nutritional liquid containing a nutritional source for a heterotrophic anaerobic microorganism to the contaminated matter, the reducing agent being a water-soluble compound having a standard electrode potential ranging from 130 mV to –2400 mV at 25°C with respect to the standard hydrogen electrode, whereby an oxidation reduction potential of the contaminated matter reduced is maintained at not more than +130 mV for at least 5 days by adding the reducing agent, wherein the contaminated matter mixed with the reducing agent and the nutritional liquid has a water content of at least 40% by weight.

38. **(Amended)** A method for purifying soil, sediment or sludge contaminated with a halogenated organic compound, which method comprises the step of:

adding a reducing agent to the contaminated matter, the reducing agent being a water-soluble compound having a standard electrode potential ranging from 130 mV to –2400 mV at 25°C with respect to the standard hydrogen electrode, whereby an oxidation reduction potential of the contaminated matter reduced is maintained at not more than +130 mV for at least 5 days by adding the reducing agent, wherein the contaminated matter mixed with the reducing agent and the nutritional liquid has a water content of at least 40% by weight.